UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/660,697	09/12/2003	Kevin Andrew Chamness	242662US6YA	7662

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EXAMINER
WEST, JEFFREY R

ART UNIT	PAPER NUMBER
2857	

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO 90C (Rev 10/03)

	Application No.	Applicant(s)
Office Action Summary	10/660,697	CHAMNESS, KEVIN ANDREW
	Examiner	Art Unit
	Jeffrey R. West	2857

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _12 April 2005_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-50_ is/are pending in the application.

    4a) Of the above claim(s) _43-46, 49 and 50_ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-42, 47 and 48_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _12 September 2003_ is/are: a)☐ accepted or b)☒ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings in Figures 1-5, 7, 8, 9A, and 9B are objected to because they do not contain sufficiently descriptive labels. In Figures 1-5, blank boxes should be labeled descriptively unless it is a well-known component. Figures 7, 8, 9A, and 9B do not contain titles providing an indication to one having ordinary skill in the art as to what they are illustrating.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: "16" (page 9, line 20).

3. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

4. The disclosure is objected to because of the following informalities:

On page 6, lines 26-29, Figure 12 is labeled as a computer system and Figure 13

is labeled as a method, while Figure 12 illustrates the method and Figure 13

illustrates the computer system.

Appropriate correction is required.

Claim Objections

5. Claims 7, 26, and 34 are objected to because of the following informalities:

In claim 7, line 3, to avoid problems of antecedent basis, "said updated centering"

should be ---said updated adaptive centering---.

In claim 26, line 5, to avoid problems of antecedent basis, "value comprises"

should be ---value of the adaptive centering coefficient comprises---.

In claim 34, line 6, to avoid problems of antecedent basis, "value comprises"

should be ---value of the adaptive centering coefficient comprises---.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly
> claiming the subject matter which the applicant regards as his invention.

7. Claims 1-42, 47, and 48 are rejected under 35 U.S.C. 112, second paragraph, as

being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is considered to be vague and indefinite because it recites, "constructing a principal components analysis (PCA) model from said data, including centering coefficients". In this limitation, it is unclear to one having ordinary skill in the art as to what "including centering coefficients" further limits (i.e. is it the principal components analysis model or the data that includes the centering coefficients).

Claims 25, 33, 41, 47, and 48 are rejected under 35 U.S.C. 112, second paragraph, for similar reasons.

Claim 2 is considered to be vague and indefinite because it attempts to further limit the step of "adjusting said centering coefficients" to include "updating the adaptive centering coefficient for each data parameter". The step of "adjusting said centering coefficients", however, recites, "adjusting said centering coefficients to produce updated adaptive centering coefficients for each of said data parameters in said PCA model". It is therefore unclear to one having ordinary skill in the art how the step of adjusting said centering coefficients can be further limited to include updating the adaptive centering coefficient when the adaptive centering coefficient is determined as a result of the adjusting step.

Claim 2 is further rejected under 35 U.S.C. 112, second paragraph, because it recites "said old value comprises a mean value of the data parameter". Claim 2 and parent claim 1 each present a plurality of data parameters and/or each data

parameter but do not specify a particular data parameter. Therefore, it is unclear to

one having ordinary skill in the art as to what data parameter "the data parameter"

refers.

Claims 9, 19, 24, 26, 28, 34, and 36, are similarly rejected under 35 U.S.C. 112,

second paragraph, for referring to "said data parameter" and/or "the data parameter"

without any previous specification of a particular data parameter.

Claim 11 is considered to be vague and indefinite because it attempts to further

limit the step of "applying said updated adaptive scaling coefficients". Parent claim

1, however, contains no such step. Therefore, it is unclear to one having ordinary

skill in the art as to what claim 11 is trying to further limit.

Claim 19 is considered to be vague an indefinite because in line 4, reference is

made to "each data parameter during a current observation of a given data

parameter". This limitation is first considered to be unclear because it refers to

"each data parameter" without any previous mention of any "data parameters".

Further, it is unclear to one having ordinary skill in the art how an operation can be

performed for each data parameter of a given data parameter.

Claim 24 is considered to be vague and indefinite because it recites "said

adaptive scaling coefficient comprising an application of an exact recursive standard

deviation formula". In this limitation, it is unclear to one having ordinary skill in the

art how a coefficient can comprise an application of a formula. Applicant is requested to re-word this limitation.

Claim 24 is also considered to be vague and indefinite because in line 7 reference is made to "an old value of the adaptive centering coefficient". It is unclear to one having ordinary skill in the art whether this "old value of the adaptive centering coefficient" refers to the previously presented "old value of said adaptive centering coefficient", as presented in claim 19, or whether this recitation refers to a different value.

Claim 26 is considered to be vague and indefinite because it recites "said additional observation" without a previous mention of any "additional observation". Therefore, it is unclear to one having ordinary skill in the art as to what "said additional observation" refers.

Claims 28 and 34 are rejected under 35 U.S.C. 112, second paragraph, for similar reasons.

Claim 28 is also rejected as being vague and indefinite because it attempts to further limit the means for "adjusting said scaling coefficients" to include "means for applying a recursive standard deviation filter to said adaptive scaling coefficients". The means for "adjusting said scaling coefficients", however, recites, "means for adjusting the scaling coefficients to produce updated adaptive scaling coefficients for each of said data parameters in said PCA model". It is therefore unclear to one

having ordinary skill in the art how the means for adjusting the scaling coefficients

can be further limited to include means for applying a recursive standard deviation

filter to said adaptive scaling coefficients when the adaptive scaling coefficients are

produced as a result of the adjusting step.

Claim 36 is rejected under 35 U.S.C. 112, second paragraph, for similar reasons.

Claim 33 is considered to be vague and indefinite because it recites both "means

for acquiring data from said plurality of sensors for a plurality of observations, said

data comprising a plurality of data variables" and "means for acquiring data from

said plurality of sensors for a plurality of observations, said data comprising a

plurality of data parameters" when page 13, lines 18-22 and page 16, lines 18-30, of

the instant disclosure, indicate that the data variables and data parameters are the

same.

Claims 3-8, 10, 12-18, 20-23, 27, 29-32, 35, 37-40, and 42 are rejected under 35

U.S.C. 112, second paragraph, because the incorporate the lack of clarity present in

their respective parent claims.

Claim Rejections - 35 USC § 101

8. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of
> matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the
> conditions and requirements of this title.

9. Claims 19-24 are rejected under 35 U.S.C. 101 because the claimed invention is

directed to non-statutory subject matter.

35 U.S.C. 101 requires that the claimed invention as a whole must accomplish a

practical application. That is, it must produce a "useful, concrete and tangible result."

State Street, 149 F.3d at 1373, 47 USPQ2d at 1601-02. The purpose of this

requirement is to limit patent protection to inventions that possess a certain level of

"real world" value, as opposed to subject matter that represents nothing more than

an idea or concept, or is simply a starting point for future investigation or research

(Brenner v. Manson, 383 U.S. 519, 528-36, 148 USPQ 689, 693-96); In re Ziegler,

992, F.2d 1197, 1200-03, 26 USPQ2d 1600, 1603-06 (Fed. Cir. 1993)).

It has also been held that a process that consists solely of the manipulation of an

abstract idea is not concrete or tangible. See In re Warmerdam, 33 F.3d 1354, 1360,

31 USPQ2d 1754, 1759 (Fed. Cir. 1994). See also Schrader, 22 F.3d at 295, 30

USPQ2d at 1459.

Claims 19-24 are not claimed as statutory subject matter but are instead claimed

as an improvement which is non-statutory under 35 U.S.C. 101. Further, claims 19-

24 provide for manipulation of coefficients. This manipulation of coefficients is only a

starting point for any implementation of the coefficients and is furthermore a

manipulation of abstract ideas without producing a concrete and tangible result.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 1-7, 11-16, 19-23, 25, 26, 33, 34, and 47, as may best be understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. 2003/0055523 to Bunkofske et al. in view of U.S. Patent Application Publication No. 2002/0107858 to Lundahl et al. and further in view of U.S. Patent No. 6,622,059 to Toprac et al.

Bunkofske discloses a method of monitoring a processing system for processing a substrate during the course of semiconductor manufacturing (0002 and 0048), comprising acquiring data from said processing system for a plurality of observations, said data comprising a plurality of data parameters/variables (0049 and 0052); constructing a principal components analysis (PCA) model from said data (0047), including centering and scaling (0056); determining at least one statistical quantity from said additional data using said PCA model (0043 and 0047); setting a control limit for said at least one statistical quantity (0059); and comparing said at least one statistical quantity to said control limit (0059).

Bunkofske discloses detecting a process fault has occurred when said at least one statistical quantity exceeds said control limit (0059).

Bunkofske discloses that constructing said PCA model comprises determining one or more principal components of said data for said plurality of observations using principal components analysis (0012)

Bunkofske discloses that said plurality of data parameters comprises an instantaneous value of at least one of chamber pressure and RF power (0006).

Bunkofske discloses that said statistical quantity comprises at least one of a Q-statistic and a Hotelling T^2 parameter (0043).

Bunkofske further discloses a controller as part of a process performance monitoring system coupled to a process tool, inherently operating in accordance with a program stored on computer readable medium, for carrying out the method as well as coupled to a plurality of sensors attached to the process tool for acquiring the data (0019 and 0049).

As noted above, Bunkofske teaches many of the features of the claimed invention and while Bunkofske does explicitly disclose that the measurement data used for constructing a principle components analysis "is scaled and centered and a correlation matrix is calculated" (0056), the disclosure of Bunkofske does not provide details regarding this process.

Lundahl teaches a method and system for the dynamic analysis of data using principal components analysis (0065) and further teaches the well-known method of performing centering and scaling comprising applying centering coefficients to each of a plurality data parameters by subtracting centering coefficients from each of said data parameters and applying scaling coefficients to each of a plurality of data parameters by dividing each of said data parameters by said scaling coefficients (0059 and 0060).

It would have been obvious to one having ordinary skill in the art to modify the invention of Bunkofske to include the scaling and centering method of Lundahl because the combination would have provided the well-known method for carrying out the centering and scaling in a conventional manner as required in the method of Bunkofske (0059 and 0060).

Further, while the invention of Bunkofske and Lundahl does teach many of the features of the claimed invention including applying centering coefficients to each of a plurality of data parameters in a PCA model, the combination does not specify that the method acquire additional data from the processing system to form an adjusted centering coefficient.

Toprac teaches an automated process monitoring and analysis system for semiconductor processing comprising acquiring data from said processing system for a plurality of observations, said data comprising a plurality of data parameters (column 4, lines 9-23), constructing a principal components analysis (PCA) model from said data (column 10, lines 46-51), acquiring additional data from said processing system, said additional data comprising an additional observation (i.e. current measurement) of said plurality of data parameters, obtaining a mean of the data parameters, and adjusting the mean of the data parameters to form an updated mean (column 18, lines 27-46).

Toprac teaches that adjusting the mean of the data parameters comprises updating the mean of the data parameters for each data parameter by combining an old value of the mean for each data parameter and a current value of each data

parameter for said additional observation, wherein said old value comprises a mean value of the data parameter during said plurality of observations (column 18, lines 27-46).

Toprac further teaches that combining said old value of said adaptive mean and said current value of said data parameter for said additional observation comprises applying an exponentially weighted moving average filter (column 18, lines 27-46) as well as setting a weighting factor to any value ranging from 0.0 to 1.0 as appropriate based on an amount of confidence (column 18, lines 47-53).

It would have been obvious to one having ordinary skill in the art to modify the invention of Bunkofske and Lundahl to specify that the method acquire additional data from the processing system to form an adjusted centering coefficient, as taught by Toprac, because the invention of Bunkofske and Lundahl teaches applying a centering coefficient in the form of a mean of a plurality of data parameters and Toprac suggests that the combination would have improved the centering performed by Bunkofske and Lundahl by smoothing the data parameters to produce a more exact value of the centering coefficient as well as increase the accuracy by applying a centering coefficient that is consistently updated (column 18, lines 47-53).

12. Claims 17, 29, 30, 37, 38, 41, and 48, as may best be understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Bunkofske et al. in view of Lundahl et al. and Toprac et al and further in view of U.S. Patent Application Publication No. 2003/0144746 to Hsiung et al.

As noted above, Bunkofske in combination with Lundahl and Toprac teaches many of the features of the claimed invention and while the invention of Bunkofske, Lundahl, and Toprac does teach acquiring many types of data, including adaptive scaling coefficients, the combination does not specifically include obtaining the many types of data via at least one of an intranet and an internet from a second process.

Hsiung teaches control for an industrial process using one or more multidimensional variables comprising a first industrial process connected to a second industrial process and/or server via an internet for accessing data (0036, 0040, and 0045) wherein the data is used in performing principal component analysis (0066 and 0106).

It would have been obvious to one having ordinary skill in the art to modify the invention of Bunkofske, Lundahl, and Toprac to specifically include obtaining the many types of data via at least one of an intranet and an internet from a second process, as taught by Hsiung, because, as suggested by Hsiung, the combination would have improved the overall analysis of the first process by validating the many types of data by comparison with the same data from a similar process (0036).

13. Claims 8, 27, and 35, as may best be understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Bunkofske et al. in view of Lundahl et al. and Toprac et al and further in view of U.S. Patent No. 5,949,678 to Wold et al.

As noted above, Bunkofske in combination with Lundahl and Toprac teaches many of the features of the claimed invention and while the invention of Bunkofske,

Lundahl, and Toprac does teach determining scaling coefficients for the PCA model

and applying said scaling coefficients to each of said data parameters in said PCA

model, the combination does not specifically include adjusting the scaling

coefficients to produce updated adaptive scaling coefficients.

Wold teaches a method for monitoring multivariate process comprising

performing PCA by applying centering and scaling (column 11, lines 60-65) wherein

the centering is performed using a EWMA filter and subtracting centering values to

update the EWMA (column 12, lines 18-30) and scaling is performed by dividing the

data set by a standard deviation wherein the standard deviation (i.e. scaling

coefficient) is updated/adapted based on weighted local data (column 12, lines 31-

42)

It would have been obvious to one having ordinary skill in the art to modify the

invention of Bunkofske, Lundahl, and Toprac to specifically include adjusting the

scaling coefficients to produce updated adaptive scaling coefficients, as taught by

Wold, because, as suggested by Wold, the combination would have improved the

accuracy of the principal component analysis by adapting the scaling coefficients

based on weighted local data thereby adding more weight to more important data

and less weight to less important data (column 12, lines 31-42 and column 15, lines

14-25).

14. Claims 18, 31, 32, 39 and 40, as may best be understood, are rejected under 35

U.S.C. 103(a) as being unpatentable over Bunkofske et al. in view of Lundahl et al.,

Toprac et al., and Wold et al. and further in view of U.S. Patent Application

Publication No. 2003/0144746 to Hsiung et al.

As noted above, Bunkofske in combination with Lundahl, Toprac, and Wold

teaches many of the features of the claimed invention and while the invention of

Bunkofske, Lundahl, Toprac, and Wold does teach acquiring many types of data,

including adaptive scaling coefficients, the combination does not specifically include

obtaining the many types of data via at least one of an intranet and an internet from

a second process.

Hsiung teaches control for an industrial process using one or more

multidimensional variables comprising a first industrial process connected to a

second industrial process and/or server via an internet for accessing data (0036,

0040, and 0045) wherein the data is used in performing principal component

analysis (0066 and 0106).

It would have been obvious to one having ordinary skill in the art to modify the

invention of Bunkofske, Lundahl, Toprac, and Wold to specifically include obtaining

the many types of data via at least one of an intranet and an internet from a second

process, as taught by Hsiung, because, as suggested by Hsiung, the combination

would have improved the overall analysis of the first process by validating the many

types of data by comparison with the same data from a similar process (0036).

15. Claim 42, as may best be understood, is rejected under 35 U.S.C. 103(a) as

being unpatentable over Bunkofske et al. in view of Lundahl et al., Toprac et al and

Hsiung et al., and further in view of U.S. Patent No. 5,949,678 to Wold et al.

As noted above, Bunkofske in combination with Lundahl, Toprac, and Hsiung

teaches many of the features of the claimed invention and while the invention of

Bunkofske, Lundahl, Toprac, and Hsiung does teach determining scaling coefficients

for the PCA model and applying said scaling coefficients to each of said data

parameters in said PCA model, the combination does not specifically include

adjusting the scaling coefficients to produce updated adaptive scaling coefficients.

Wold teaches a method for monitoring multivariate process comprising

performing PCA by applying centering and scaling (column 11, lines 60-65) wherein

the centering is performed using a EWMA filter and subtracting centering values to

update the EWMA (column 12, lines 18-30) and scaling is performed by dividing the

data set by a standard deviation wherein the standard deviation (i.e. scaling

coefficient) is updated/adapted based on weighted local data (column 12, lines 31-

42)

It would have been obvious to one having ordinary skill in the art to modify the

invention of Bunkofske, Lundahl, Toprac, and Hsiung to specifically include adjusting

the scaling coefficients to produce updated adaptive scaling coefficients, as taught

by Wold, because, as suggested by Wold, the combination would have improved the

accuracy of the principal component analysis by adapting the scaling coefficients

based on weighted local data thereby adding more weight to more important data

and less weight to less important data (column 12, lines 31-42 and column 15, lines 14-25).

Response to Arguments

16. Applicant's arguments filed April 12, 2005, have been fully considered but they are not persuasive.

The Examiner asserts that because the inventions are distinct as subcombinations usable together and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper. The Examiner also asserts that a serious burden would be exist in examining the non-elected invention which requires identifying and distinguishing between fault substrate runs in classifying a process fault.

Conclusion

17. The prior art made of record and not relied upon is considered pertinent to Applicant's disclosure.

U.S. Patent No. 6,896,763 to Balasubramhanya et al. teaches a method and apparatus for monitoring a process by employing principal component analysis

U.S. Patent No. 6,330,526 to Yasuda teaches a characteristic variation evaluation method of a semiconductor device.

U.S. Patent No. 6,675,137 to Toprac et al. teaches a method of data compression using principal components analysis.

U.S. Patent Application Publication No. 2002/0072882 to Kruger et al. teaches multivariate statistical process monitors.

Cherry et al., "Semiconductor Process Monitoring and Fault Detection Using Recursive Multi-Way PCA" teaches a method for quickly and accurately detecting faulty sensors or measurements in a semiconductor processing environment.

Shirazi et al., "A Modular Realization of Adaptive PCA" teaches an adaptive PCA algorithm which alleviates suboptimality of the PCA method for non-stationary signals.

Chatterjee et al., "Algorithms for Accelerated Convergence of Adaptive PCA" teaches an adaptive algorithm for PCA that is shown to converge faster than traditional PCA.
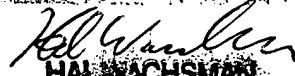
18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrey R. West whose telephone number is (571)272-2226. The examiner can normally be reached on Monday through Friday, 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marc S. Hoff can be reached on (571)272-2216. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR

only. For more information about the PAIR system, see http://pair-direct.uspto.gov.

Should you have questions on access to the Private PAIR system, contact the

Electronic Business Center (EBC) at 866-217-9197 (toll-free).

jrw
June 25, 2005

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